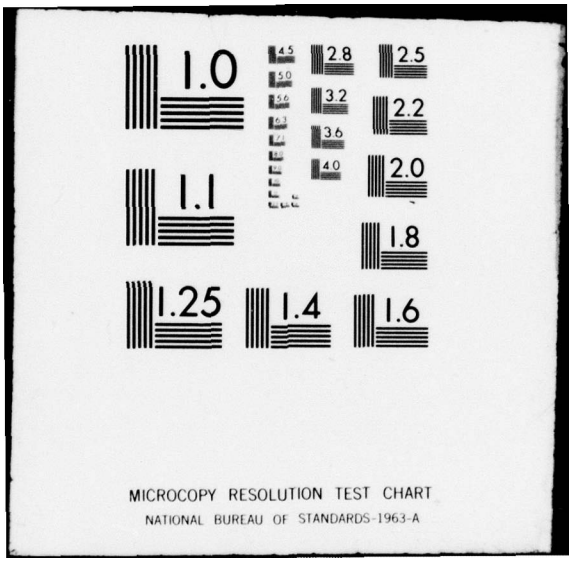
AD-A069 855 COLD REGIONS RESEARCH AND ENGINEERING LAB HANOVER NH F/G 4/2
DISTRIBUTION OF SNOW DEPTH IN THE USSR (KHARAKTERISTIKA RASPRED--ETC(U)
MAY 78 I D LOPANEV, V I LIPOVSKAYA

UNCLASSIFIED CRREL-TRANS-687 NL

| OF |
AD
A069855

END
DATE
FILMED
7 -79
DDC

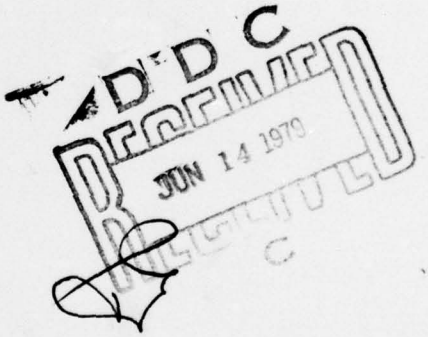

1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Draft Translation 687

DISTRIBUTION OF SNOW DEPTH IN THE USSR

I.D. Kopanev and V.I. Lipovskaya

May 1978



CORPS OF ENGINEERS, U.S. ARMY
COLD REGIONS RESEARCH AND ENGINEERING LABORATORY
HANOVER, NEW HAMPSHIRE

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER Draft Translation 687	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* DISTRIBUTION OF SNOW DEPTH IN THE USSR		5. TYPE OF REPORT & PERIOD COVERED 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) I.D. Kopanev and V.I. Lipovskaya		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Cold Regions Research and Engineering Laboratory Hanover, New Hampshire		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS		12. REPORT DATE May 1978 13. NUMBER OF PAGES 15p.
14. MONITORING AGENCY NAME & ADDRESS *(if different from Controlling Office)*		15. SECURITY CLASS. *(of this report)* 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

SNOW SURVEYS
SNOW COVER DISTRIBUTION
SNOW DEPTH
MAPS

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

Information about the snow cover is widely used not only when solving the corresponding scientific problems but also in regular practice: when estimating the conditions under which farm crops will winter and when forecasting the areas involved in winter kill and where winter crops will have to be replaced by spring crops; when forecasting the moisture reserve in the soil in the spring for winter and spring crops and forecasting the yields of these crops; when estimating and predicting the winter

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

pasturing conditions for livestock in livestock grazing and reindeer growing areas; when forecasting the spring runoff and the flood elements; when estimating and forecasting the possibilities for movement of various forms of transportation, especially in Siberia and the Far North; when performing geological exploration work, and so on. There is almost no branch of the national economy which has not exhibited interest in information about the snow cover.

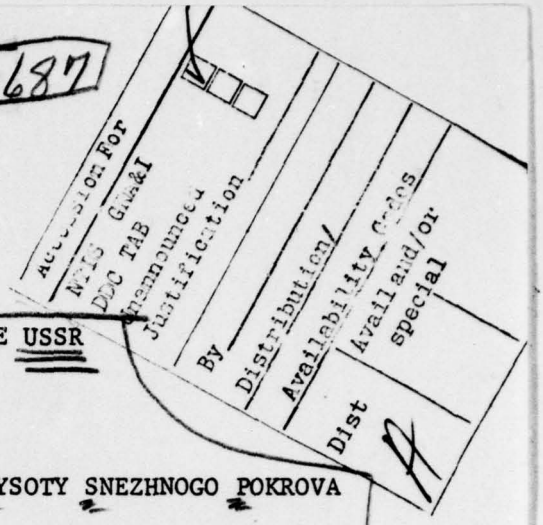
The basic purpose of the information on the snowcover is connected with the study of the climatic and hydrologic regime of the territory of our country, the requests for routine servicing of the national economy with agrometeorogical and hydrologic forecasts, and so on.

Experience shows that in the majority of cases the snow cover distribution is basically characterized by the data at the time of maximum snow accumulation at the beginning of the spring thaw.

(11) May 78 (14) CRREL - TRANS-687

(12) 19p.

DRAFT TRANSLATION 687



(6)

ENGLISH TITLE: DISTRIBUTION OF SNOW DEPTH IN THE USSR

FOREIGN TITLE: KHARAKTERISTIKA RASPREDELENIIA VYSOTY SNEZHNOGO POKROVA NA TERRITORII SSSR

(10)

AUTHOR: I.D. Lopanev and V.I. Lipovskaya

(21)

SOURCE: Trans. of Leningrad, Glavnaia geofizicheskaia observatoriia Trudy, vol. 361, ~~1976, p.72-86.~~ (USSR) v361 p72-86 1976.

CRREL BIBLIOGRAPHY
ACCESSIONING NO.: 32-616

Translated by U. S. Joint Publication Research Service for U.S. Army Cold Regions Research and Engineering Laboratory, 1978, 15p.

NOTICE

037 100

43

DISTRIBUTION OF SNOW DEPTH IN THE USSR

Leningrad TRUDY in Russian 1976 pp 72-86

[Article by I. D. Kopanev, V. I. Lipovskaya]

[Text] Information about the snow cover is widely used not only when solving the corresponding scientific problems but also in regular practice: when estimating the conditions under which farm crops will winter and when forecasting the areas involved in winter kill and where winter crops will have to be replaced by spring crops; when forecasting the moisture reserve in the soil in the spring for winter and spring crops and forecasting the yields of these crops; when estimating and predicting the winter pasturing conditions for livestock in livestock grazing and reindeer growing areas; when forecasting the spring runoff and the flood elements; when estimating and forecasting the possibilities for movement of various forms of transportation, especially in Siberia and the Far North; when performing geological exploration work, and so on. There is almost no branch of the national economy which has not exhibited interest in information about the snow cover.

The basic purpose of the information on the snowcover is connected with the study of the climatic and hydrologic regime of the territory of our country, the requests for routine servicing of the national economy with agrometeorogical and hydrologic forecsts, and so on.

Experience shows that in the majority of cases the snow cover distribution is basically characterized by the data at the time of maximum snow accumulation at the beginning of the spring thaw.

Under modern conditions when solving any of the applied problems information is needed for the period from the beginning of the formation of the snow cover to its disappearance considering the territory of distribution in the winter season. For example, snow management on the farmlands aimed at improving the soil moisture and thermal conditions, the control of snow drifts on railroads and highways, snow removal work in the mineral extraction areas are usually connected with great material expenditures. In order

significantly to reduce the volume of the expended means, it is necessary to know the peculiarities of the formation of the snow cover and to have reliable and detailed information about its distribution available to us.

The snow measuring network in our country has developed as the practical demand has grown. The principle of the organization of snow measuring observations at uniformly distributed geographic locations was observed. The like nature of the measurment techniques and the data processing procedures used will permit us to obtain comparative data which is an important condition for the generalizations and further studies of the snow cover.

On expansion of the snow measuring network and accumulation of the data, generalizations were made reflecting the distribution of the snow depth of the USSR [1 to 16].

In the last decade, on the basis of processing the data from many years of observations a number of authors have had the possibility of making generalizations in the form of maps. The maps contain the following characteristics: 1. dates of formation of the snow cover; 2. water reserves in the snow cover on 28 February; 3. maximum water reserves in the snow cover; 4. dates of occurrence of the maximum water reserve in the snow cover; 5. height of the snow cover on the data of occurrence of the maximum water reserve in the snow cover; 6. dates of disappearance of the snow cover. In addition to the annual maps, maps are also presented for the mean maximum water reserves in the snow cover and the dates of their occurrence, the water reserves in the snow cover on 28 February and the dates of disappearance of the snow cover.

When compiling the maps the European territory of the Soviet Union, materials were used from the snow measuring surveys of the stations located under open terrain conditions. The maps of the Asiatic territory of the USSR were compiled on the basis of processing the snow survey data for both open and protected sections.

However, in our opinion, the information about the snow cover distribution for individual months and also its variation from month to month, from the time of formation of the stable cover to its disappearance, are of no less interest. For this purpose, the Main Geophysics Observatory has constructed snow depth maps for the plains region of the USSR for the last ten days of each month during the period from October to April and also the maps of the greatest and least (of the greatest) ten-day depths. The data from the snow measuring surveys in the period from 1936 to 1965 appearing in the Climate References for the USSR served as the data for constructing these maps. The observations in the sections in the forest under the trees and forest glades were taken as the basis for constructing the maps. In some cases the data from the fields were also used. The analysis of the maps gives a quantitative picture of the snow depth distribution by months and the limit of spread of the snow over the territory of the USSR.

The first snow in the European territory of the USSR appears during October to November, and the stable snow cover in the northern regions and the

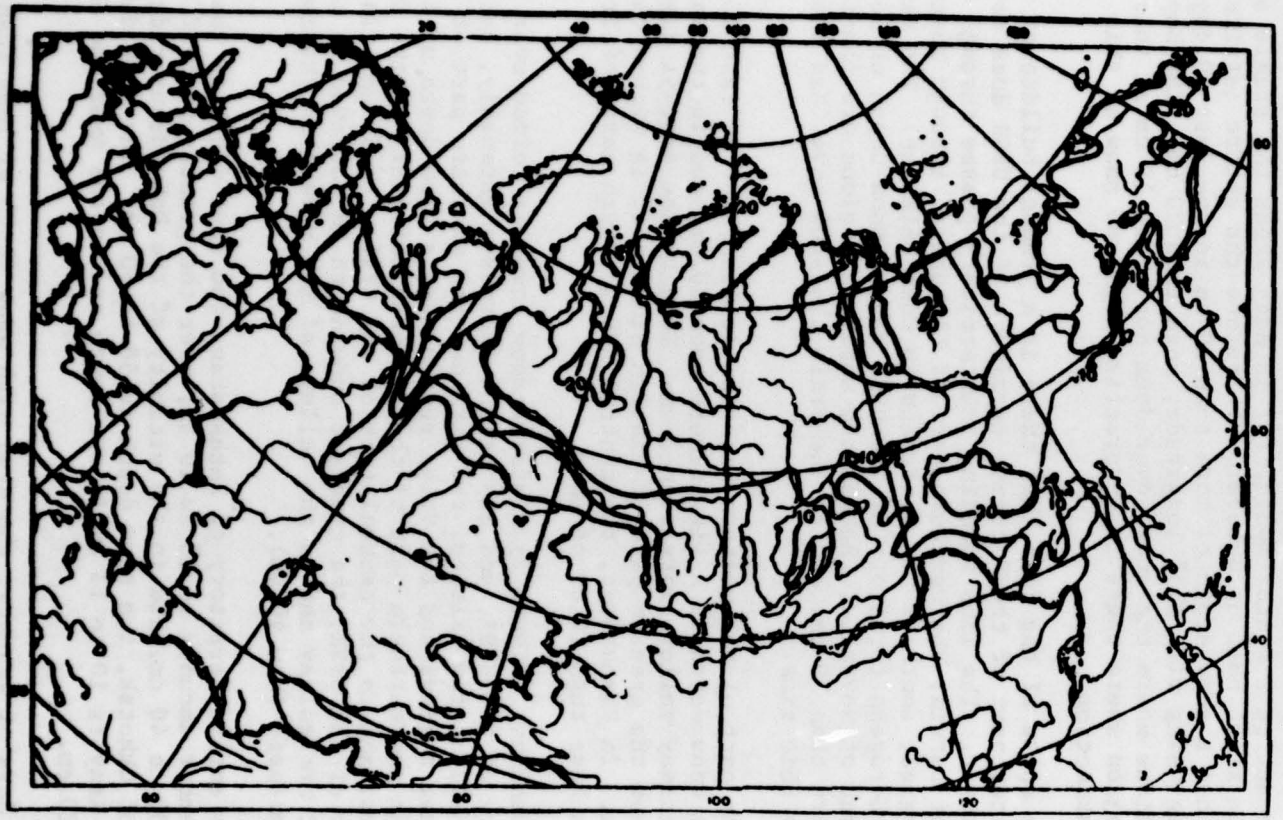


Figure 1. Average perennial snow depth for the last 10 days of October.

foothills of the Urals is formed in the last ten days of October to the beginning of November. In the central and southern regions this occurs at the end of November to December. Therefore on the October map (see Figure 1) none of the territories south of 60° north latitude has a stable snow cover. Only the Urals and the areas directly adjacent to them are encompassed by the 10 cm isoline. Over the greater part of the Asian territory of the USSR, October is in practice a winter month, for in many areas the stable snow cover is formed in the first half of October. Therefore the entire territory beyond the Urals has a snow depth of more than 10 cm in the last 10 days of October, and beginning with 115° longitude, more than 20 cm. The Baykal and Transbaykal regions where the snow cover does not reach 10 cm at this time and the Amur region where there is in practice still no snow at this time constitute an exception.

In November, in spite of the fact that there is a gradual buildup of snow depth, the greater part of the European territory of the USSR does not have a stable snow cover. The line bounding this territory passes through the southern part of Latvia, the northern part of Lithuania, through Moscow, Khar'kov, Volgograd, south of the Urals and to Lake Balkhash. The central regions of the European territory of the USSR have a snow depth of less than 10 cm by the end of November, whereas the northern regions are characterized by depths of more than 10 cm, and in the Urals the snow cover has reached half a meter by this time.

Over the greater part of the western Siberian lowland, in the last 10 days of November the snow depth is a little more than 20 cm, and in the eastern part and the Yenisey valley, more than 3 cm. Then to the east it dimishes somewhat and over the greater part of eastern Siberia it is within the limits of 20 cm. In Kazakhstan, the central and southern parts of Transbaykal there is less than 10 cm of snow.

By the end of December (Figure 2) a stable snow cover is formed over the entire territory of the USSR, and its height increases intensely, but highly nonuniformly. All of the Baltics, the Ukraine, the southern part of the central Chernozem regions and the Volga region have a snow depth of less than 10 cm whereas in the northern part of the European territory of the USSR, from 20 to 40 cm, and in the central part of the Urals, to 50 cm. In the Asian territory of the USSR, the greatest snow depth is observed in the central part of the Yenisey and in the valleys of the rivers of the central Siberian plateau (more than 40 cm).

Almost over the entire territory of Kazakhstan, the snow depth in the last 10 days of November amounts to 10 to 20 cm; over the greater part of eastern Siberia it is 30 to 40 cm, and in the vicinity of the Dzhugdzhur ridge and along the Sea of Okhotsk, the snow depth is 50 to 60 cm. The snow depth in the Primorskiy Kray is 10 to 15 cm in the south and in the Amur and Amgun' River basins, 20 cm.

In the last 10 days of January, the area with snow depth of less than 10 cm is reduced significantly and it encompasses the territory including the coastal regions of Latvia and Lighuania, western and southern parts of the Ukraine, the Krasnodar and Stavropol' Krays and the Volga region south of

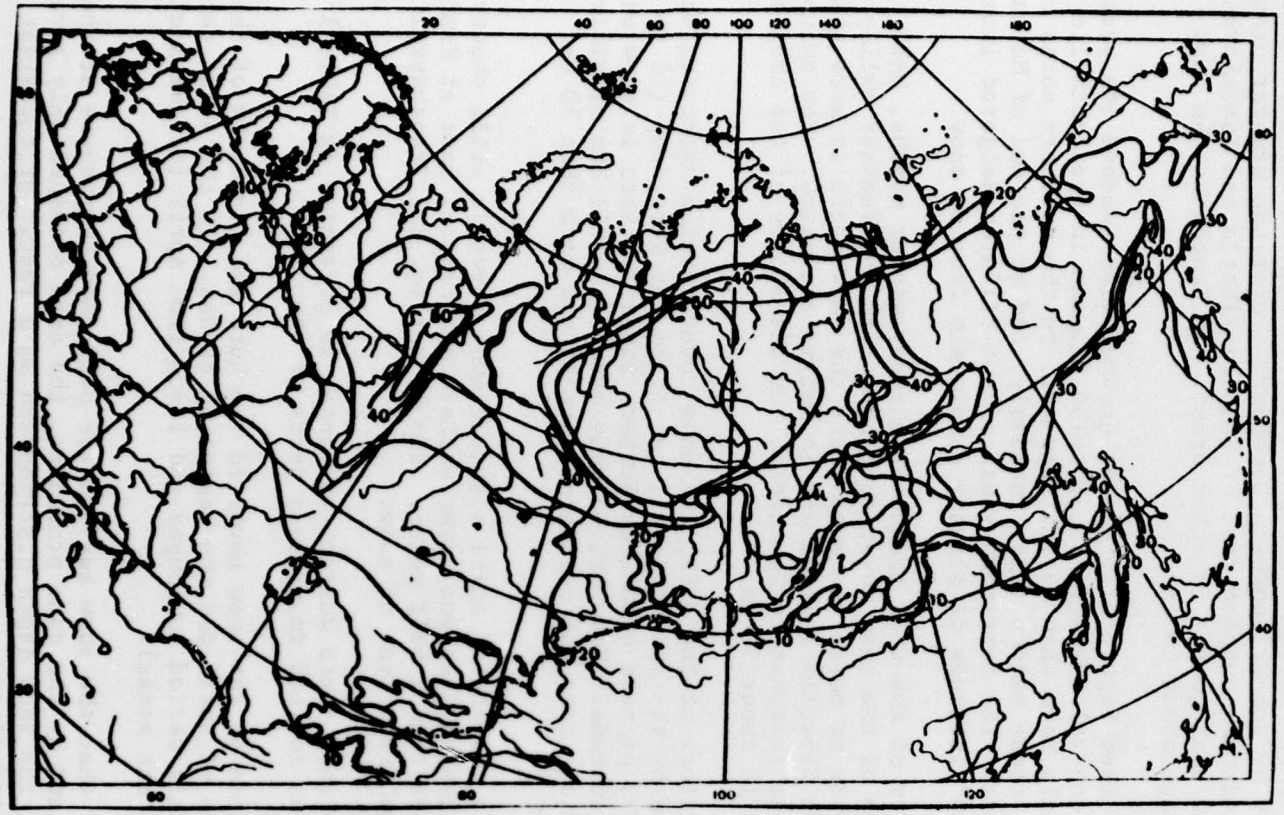


Figure 2. Average perennial snow depth for the last 10 days of December.

Volgograd. The entire central section has depths from 20 to 40 cm, and the northern regions, more than 40 cm.

In the Asian territory of the USSR no significant changes in the snow depth took place in January by comparison with December: over the greater part it is 30 to 40 cm, and the southern part of Western Siberia and Kazakhstan it is 10 to 20 cm and analogously in other areas. In Kamchatka the snow depth is on the average about 60 cm.

In February to March (see Figure 3) the snow accumulation reaches its peak: in the northern and central areas it is 30 to 50 cm, and in the foothills of the Urals and the Urals more than 60 cm. However, in the southern parts of the USSR the snow in these months melts intensely, and at the end of March it entirely disappears. The territory south of the Vil'nyus Belgorod line and then along the 40° latitude is already completely free of snow.

In the Asian territory of the USSR these are already winter months, and therefore the buildup of the snow cover continues: in the Yenisey valley its depth reaches 80 cm or more; the area where the snow depth is more than 50 cm, in the Western Siberian lowland and in Kalyma increases. The amount of snow also increases somewhat in Kamchatka. On the shores of the Arctic seas, the snow depth is about 30 cm.

In the European territory of the USSR, the snow cover remains approximately to 58° north latitude by the end of April, but it is not very deep (10 to 20 cm). The analogous picture occurs in Western Siberia; there is snow only north of 58° north latitude. However, in many areas it still has significant depth: more than 40 cm along the northern seacoast and more than 50 cm in the Yenisey valley.

In Eastern Siberia by the end of April a stable snow cover is still observed everywhere. In the Lena and Kolyma River valleys and central part of Kamchatka, the snow depth is more than a half meter. The Primor'ye, the Transbaykal and Baykal regions are entirely free of snow.

The variation of the snow depth during the winter is presented in Table 1 below for the stations located in various parts of the USSR.

The final disappearance of the snow cover in the European territory of the USSR comes at the end of April and the beginning of May. In the Asian territory of the USSR this period is longer and lasts from April (in the south) to June (in the northern areas).

In spite of the fact that the snow surveys are performed everywhere at the same calendar times and by the same procedure, the data obtained only gives a general picture of the snow depth distribution as a result of the great variety of natural conditions.

It is natural that the snow depth can fluctuate from year to year within large limits depending on the meteorological conditions in the winter. The figures presented in Table 2 for the individual stations located in various

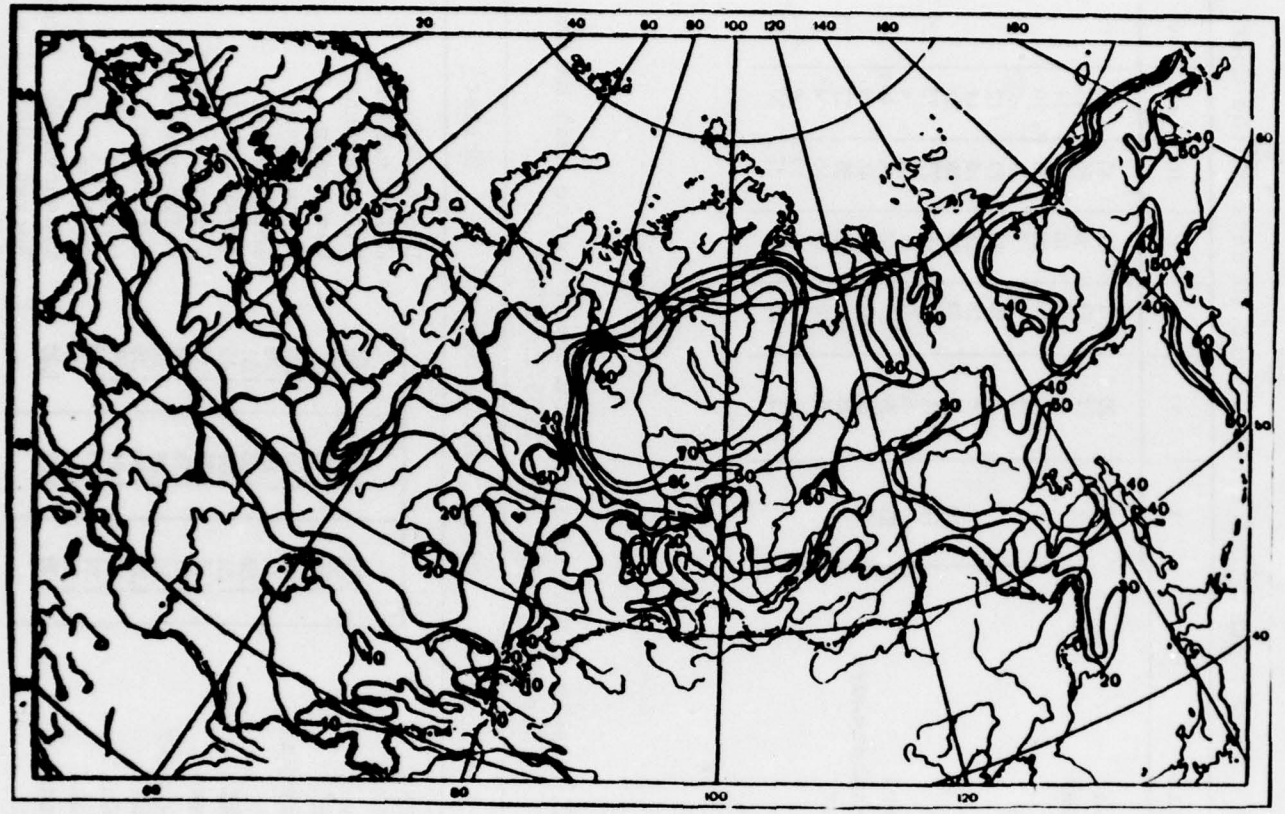


Figure 3. Average perennial snow depth for the last 10 days of February.

parts of the country give some idea about this. The ratio of the maximum depth which was observed during the period from 1935 to 1965 to the average maximum to some degree characterizes the stability of formation of the snow cover in one area or another.

Table 1. Snow depths (cm) for the last 10 days of the month

Station	X	XI	XII	I	II	III	IV
Ust'-Usa	8	20	32	37	43	48	49
Shenkursk		12	24	36	46	44	
Riga		7	10	18	25	14	
Gor'kiy		6	14	28	31	19	
Kiev		2	4	7	4		
Orel		4	10	14	20	12	
Syzran'	10	5	16	24	26	14	
Salekhard	18	18	24	28	30	31	
Verkhneimbatskoye		41	57	66	72	73	59
Pavlodar	21	6	9	11	12	4	
Olenek	8	30	37	43	46	49	44
Ilimsk		22	33	42	45	41	
Kozyrevsk		24	44	52	56	57	20
Khabarovsk		5	10	10	10	4	
Plastun			12	15	19	4	
Nogliki		15	26	31	37	37	16

Table 2. Ratio of the maximum snow depth to the mean maximum (for the period from 1935 to 1965)

Station	Field	Glade	Forest	Oblast'
Belogorka				Leningrad
Maksatikha				Kalininskaya
Danilov	1,33	1,18	1,88	Yaroslavskaya
Cherdyn'	1,39	1,30	1,55	Permskaya
B. Shabanka	1,31	1,12	—	Kirovskaya
Purekh	1,16	1,10	1,05	Gor'kovskaya
Pochinki	1,14	1,19	1,28	Moskovskaya
Semenovka	1,58	1,36	1,51	Chernigovskaya
Dundukovskiy	1,31	1,31	1,13	Volgogradskaya
Shadrinsk	2,14	1,28	1,14	Kurganskaya
Isil'-Kul'	1,21	1,13	1,28	Omskaya
Tobol'sk	1,45	1,34	1,62	Omskaya
Turukhansk	1,70	1,66	1,38	Krasnoyarsk Kray
Baunt	1,54	1,24	1,26	Buryat ASSR
Kartun	1,24	1,26	1,20	Primorskiy Kray
	1,44	1,41	—	
	1,39	1,53	1,20	

Table 2 indicates that the maximum snow depth at the same stations experiences great fluctuations both in the field and in the protected sections (forest, glade). In the forest under the trees the fluctuations of the depth is somewhat less with respect to absolute value than in the field or in the glades.

Over a significant part of the territory of the USSR the maximum snow depth comes in March. In the areas with positive cold period the maximum is noted in April, and in the southern part of the European territory of the USSR, in February.

An idea of the nature of the snow accumulation in various areas can be obtained from the maps (see Figures 4 to 5) and Table 3 in which the differences between the maximum snow depth at the beginning of the thaw and the depth on 20 January when a stable snow cover has been formed over almost the entire territory of the USSR, are presented.

The data indicate that the snow accumulation process in the various areas takes place differently. This depends not only on the amount of precipitation and its distribution in time but also on the monthly factors.

The increase in the average snow depth from the middle of January to the beginning of the spring thaw is according to the snow survey data in the field sections about 13 cm and in the forest glades and in the forest under the trees, 17 and 19 cm respectively. In the remaining areas, depending on the precipitation and the warmings, and the snow storm redistribution, the increase can reach significantly larger values. The greatest increase in depth of the snow in the second half of the cold period in protected areas is noticed in the areas with developed cyclonic activity. In the southern parts of Eastern Siberia in the second half of the cold period when the Asiatic anticyclone reaches the greatest development, the increase in snow depth throughout the territory is comparatively small. On 20 January the mean perennial snow depth is 30 cm here, and by the end of the melting season, 40 cm, that is, the snow depth basically is formed in the first half of the cold period.

On the maps (see Figures 4 to 5) we have the extremal (maximum and minimum) values of the snow depth by the beginning of the spring thaw according to the snow survey data for the 1935 to 1965 period.

In the European territory of the USSR, a maximum snow depth of 90 cm or more is noted on the western slopes of the Northern Urals. On going to the west, the depth decreases noticeably, dropping to 60 to 70 cm in the areas of the Gorkiy and Kirov oblasts. A sharper decrease in the snow depth is observed in the southern direction. Thus, near Uralsk the depth does not exceed 30 cm, and in the Caspian lowland, 10 to 15 cm. The Volga highland where the depth near Penza is about 70 cm is noticeably isolated. Within the boundaries of the central Russian highland the depth does not exceed 50 cm, and the Volyno Podolsk highland, 35 cm. On the Kola peninsula, as a result of the complex relief, the snow depth fluctuates from 40 to 80 cm. In the planes part of the European territory of the USSR, smooth variation of the

Figure 4. Greatest ten-day snow depth.

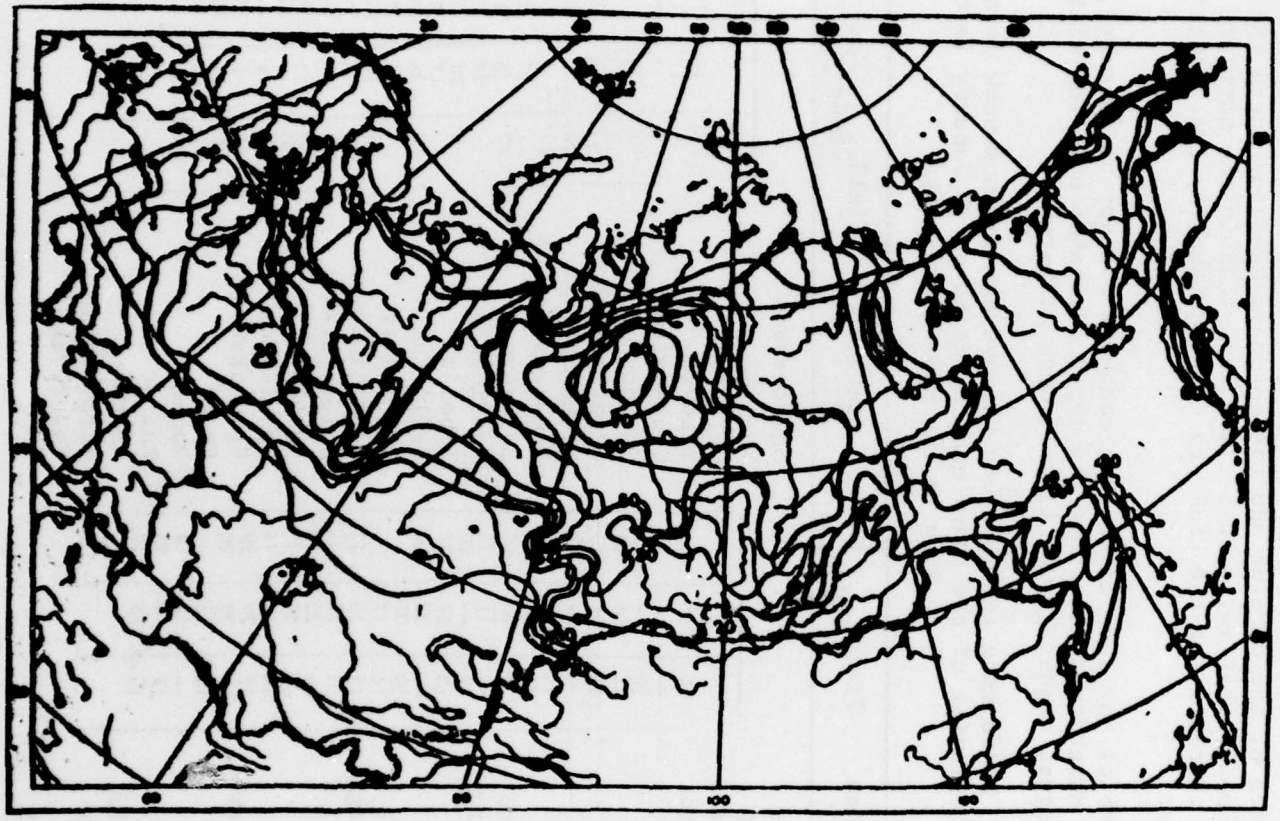


Figure 5. Least (of the greatest) ten-day snow depth.

depth is traced from west to east from 20 to 25 cm in the Baltic and Belorussian areas to 30 to 35 cm in the eastern regions. The southern limit of the 20 cm isoline passes through Kaliningrad, Gomel', Khar'kov and Volgograd. The southern parts of the Ukraine and the northern Caucasus where the snow depth is 10 to 15 cm, that is, 4 to 5 times less than in the northern parts of the European territory of the USSR are distinguished by the greatest depth of the snow cover.

The maximum depth of the snow cover here comes in January to February, in contrast to the northern areas where the depth increases over the winter, reaching the largest amount in the last 10 days of March.

Table 3. Difference (cm) between the average maximum snow depth (by the beginning of the thaw) and the depth on 20 January (according to the snow survey data)

Station	Field	Glade	Forest	Station	Field	Glade	Forest
Shugozero				Mokrousovo			
Kingisepp	15	17	—	Shumikha	—	10	14
Belogorka	—	17	16	Gorovtsy	—	11	17
Tolmachevo	20	—	16	Vileyka	5	—	19
Vereb'ye	—	10	13	Gantsevichi	6	12	6
Okhony	15	21	19	Semenovka	—	13	7
Kresttsy	—	—	19	Serafimovich	14	9	7
Danilov	14	—	21	Kletskaya	10	—	17
Uglich	23	25	22	Dundukovskiy	15	9	
Maksatikha	10	25	12	Berezovo	—	15	22
Aleksandrov	—	17	24	Kondinskoye	17	23	27
Kazan'	17	—	20	Tobol'sk	—	24	25
Cherdyn'	13	17	27	Isil'-Kud'	6	26	19
Solikamsk	—	22	34	Turukhansk	—	13	20
Vereshchagino	19	27	—	Dzerzhinskoye	26	36	31
Perm'	14	17	—	Krasnoyarsk	6	22	29
Kungur	15	15	19	Kurbatovo	6	15	—
Pochinki	9	17	—	Omsukchan	13	—	19
B. Sareyevo	—	25	19	Srednikan	12	—	20
Purekh	—	27	13	Untar	25	—	20
Gor'kiy	12	21	14	Baunt	30	—	23
Melekess	14	29	29	Amazar	3	4	—
Marychevka	13	20	20	Kartun	2	3	8
Dolmatovo	—	15	—	Kirovskiy	13	17	12
Sarapul	17	12	8	Ussuriysk	10	13	—
Shadrinsk	10	—	23		3	6	—
		13	17				

Within the boundaries of Western Siberia, the greatest snow depth is noted in the forest zone, increasing as a result of the effect of the Urals ridge from west to east from 50-60 to 90 cm or more in the Yenisey valley. In

the southern part of the Western Siberian lowland, the snow depth is appreciably less than in the northern areas and on the average it is 35 cm. In the areas of the Kazakh area of low, rounded, isolated hills, the snow depth in the sections that are protected from the wind reaches 45 to 50 cm, and in the open sections, 20 to 30 cm. On the southwest slopes of Altay, the snow depth can reach 100 to 125 cm or more, and in the open valleys, 25 to 35 cm. As a result of the peculiarities of the circulation processes, the snow accumulation over the greater part of Western Siberia takes place in the first half of the cold period. The intensity of the increase in the snow depth is not the same everywhere. In the forest zone more or less uniform snow accumulation is noted over the winter months, and in the northern areas (the tundra) the depth increases quite rapidly in the first half of the cold period, and then it remains almost invariant as a result of the packing effect of the wind.

In the territory of Eastern Siberia, the greatest average snow depth is noted in the northern regions, to 85 to 100 cm or more. In the southern part of the Central Siberian plane, the depth decreases to 50 cm, and in the Angara valley, to 25 to 30 cm.

In the steppe regions the snow depth is small and is characterized by great nonuniformity. Then on the southwest slopes of the ridges the depths can reach 150 cm or more (Sayana), and in individual parts the Aldanskoye highlands, to 75 cm.

In the western parts of Yakutia, the average maximum snow depth is 35 to 45 cm, and near Verkhoyansk and Oymyakon the snow depth does not exceed 35 cm. Over the greater part of Eastern Siberia the maximum snow depth is noted in the last days of February.

The regions of the Far East are distinguished by great spottiness in the snow depth distribution. In the northeast the greatest snow depth is 45 to 55 cm in the open sections and about 100 cm in the valleys. Along the coast of the Bering and the Okhotsk Seas, the maximum snow depth is 30 to 50 cm in the open sections, and it is 65 to 85 cm in the valleys. In the southeastern part of Kamchatka the maximum snow depth reaches 100 to 120 cm or more. Over the greater part of Sakhalin, the snow depth in the areas protected from wind is 60 to 75 cm, and in the open areas it is 40 to 50 cm. Along the coast of the Sea of Japan, the depth diminishes to 20 cm in the open areas and to 40 to 50 cm in the protected areas.

The snow depth in the Amur region is 50 to 60 cm in the protected areas and 30 to 40 cm in the open areas. The maximum snow depth here comes in February to March, and in the southern regions (Chukotka), in April and often in May.

The degree to which the snow depth distribution has been studied by months over the continental parts of the earth can be described as follows.

Until recently only the world map of G. D. Rikhter and L. A. Petrov [9] have been published with indications of the snow cover boundaries. When

compiling this map data were used on the duration of the snow cover with isolation of four territorial groups: a) territory constantly covered with snow and ice, b) a snow cover formed annually with different duration, c) territories where the snow cover is formed annually but has stability both with respect to duration and times of formation, d) territory where the snow cover is almost never formed.

The absence of world maps of the snow cover distribution can be explained, on the one hand, by the great complexity of processing the statistical data for compiling them and, on the other hand, purely procedural difficulties. Usually the majority of stations and outposts where the snow measurment observations are made is basically located in the plains, in the river valleys, near populated areas, and so on.

The gathering and the estimation of the reliability of the snow measuring observation data present great difficulties. Far from all of the countries of the world publish materials on the snow measuring observations (especially in Asia, Africa and Latin America). In the available references and annuals, tables are presented which characterize the distribution of the depth, density and water reserve in the snow. Frequently these are incomplete, scattered data resulting from various methods of recording the data and processing the snow measurement observations. The mapping of the snow cover is complicated by the absence of observation data for the same winter.

The creation of world maps of the snow cover has great scientific and practical significance. These maps should reflect the existing peculiarities of the snow cover distribution and serve as the basis for discovering the role of the snow cover in the development of natural processes.

BIBLIOGRAPHY

1. Drozdov, O. A., SNEZHNYY POKROV V TATARSKOY RESPUBLIKE (Snow Cover in the Tatar Republic), Kazan', 1934, 83 pages.

2. KARTY SNEZHNOGO POKROVA YEVROPEYSKOY CHASTI SSR ZA PERIOD S 1936 PO 1960 (Maps of the Snow Cover of the European territory of the USSR from 1936 to 1960), Moscow, Izd-vo TsIP, 1961.

3. Kopanev, I. D., "Snow Cover Distribution," TR. GGO (Works of the Main Geophysics Observatory), No 195, 1966, 216-221.

4. Kotlyakov, V. M., SNEZHNYY POKROV ZEMLI I LEDNIKOV (Snow Cover of the Earth and Glaciers), Leningrad, Gidrometeoizdat, 1968, 479.

5. Lipovskaya, V. I., Shcherbakova, Ye. Ya., "Greatest Ten-day Snow Depth of Different Probability in the Territory of the USSR," TR. GGO (Works of the Main Geophysics Observatory), No 161, 1964, 10-22.

6. Malishevskaya, N. A. "Characteristic of the Snow Cover in the Territory of Belorussia," SB. MINSKOY GMO (Collection of Minsk Hydrometeorological Observatory), No 3, 1961, 116-135.

7. Plakatina, F. I., "Snow Depth in the Territory of the Irkutsk Oblast," SB. IRKUTSKOY GMO (Collection of the Irkutsk Hydrometeorological Observatory), No 1, 1966, 21-28.

8. Pupkov, V. N., "Formation, Distribution and Variability of the Snow Cover in the Asian Territory of the USSR," METEOROLOGIYA I GIDROLOGIYA (Meteorology and Hydrology), No 8, 1964, 34-40.

9. Rikhter, G. D., Petrova, L. A., "Schematic of the Spread of the Snow Cover over the Continental Surfaces of the Earth," GEOGRAFIYA SNEZHNOGO POKROVA (Snow Cover Geography), Moscow, Iz-vo AN SSSR, 1960, 5-7.

10. Rubinshteyn, Ye. S., "Snow Depth and Number of Days in the Year with Snow Cover during the Period from 1892 to 1915," ATLAS PROMYSHLENNOSTI (Industry Atlas), No 5, Izd. Prezidiuma VSNKh SSSR, 1931.

11. Rutkovskaya, N. V., "Maximum Snow Depth in the Southeastern Part of the Western Siberian Lowland," TR. TOMSKOGO GOS. UN-TA. SER. GEOGR. (Works of the Tomsk State University. Geography Series), Vol 147, 1957.

12. Rykachev, M. A., "Snow Cover in Connection with the 1908 Flood," ISSLEDOVANIYE VESENNEGO POLOVOD'YA 1908 (Study of the 1908 Spring Flood), No 2, 1923, 1-20.

13. Sitnova, Ye. V., "Procedure for Snow Measuring Observations in the Primorskiy Kray," TR. GGO (Works of the Main Geophysics Observatory), No 175, 1965, 15-18.

14. Spengler, O. A., "Some Peculiarities of the Snow Cover Distribution in Northern Kazakhstan," TR. 3-GO VESESOYUZ. GIDROL. S'YEZDA (Works of the Third All-Union Hydrologic Congress), Vol 3, Leningrad, 1959, 231-234.

15. Sheirok, A. M., VYSOTA SNEGOVOGO POKROVA V YEVROPEYSKOY CHASTI SSSR (Snow Depth in the European Territory of the SSSR), Izd. GGO, 1926, 23 p.

16. Shostakovich, V. B., "Snow Cover in Eastern Siberia," GEOFIZ. SB (Geophysics Collection), Vol 4, No 3, 1925, 111-123.